How can computation create art?

1. Human uses computer to modify digital images
2. Human uses computer as drawing/painting tool
3. Human designs algorithm; computer follows to create exact picture (e.g. drawing in Scratch)
4. Human designs algorithm w/ some randomness, unknown result
   - Human examines results, picks most appealing
   - Or, computer “evaluates” and shows best (according to some metric)
5. Human interacts with computer
   - Algorithm translates pitch to shape; volume to size; movement to color
   - Golan Levin makes art that looks back at you

1) Modify Digital Images

2) Computer as Paint Editor
3) Computer draws same picture by following algorithm

Program (Problem) Specification
- Describes problem to be solved
  - What should outputs be? (as function of inputs)
  - Does not say HOW to solve the problem (not the algorithm!)
- What is Output? Anything coming off computer...
  - Anything sent to display (Scratch: Stage)
  - Anything sent to printer
  - Messages sent over network
  - Data stored permanently in files
- What is Input? Anything going into computer...
  - User typing on keyboard
  - Mouse actions
  - Messages arriving over network
  - Data read from files
  - Any other sensors (GPS location, motion)

What is the Specification?
Initial state:
  - Starts with background
Draws:
  - 1 house
  - 5 trees on grass
  - 3 stars in sky
  - Takes no input!
How?
What steps? algorithm?

Art in Scratch: Pen
Art in Scratch: Pen

To choose a color:
- Use the eyedropper to click on the color you want. Color appears in square.

Start leaving a pen trail
- set the pen color to blue
- move 20 steps
- set the pen color to green
- move 20 steps

Art in Scratch: Stamp

Start leaving a pen trail
- set the pen color to light blue
- set the pen size to 20
- move 20 steps

Clear all the stamps and lines
- repeat 9 times:
  - move 20 steps
  - turn 45 degrees
  - stamp

Stamp a print of your costume on the stage

Note: If the pen shade is 0, then the pen color will be black.
If the pen shade is 100, the pen color will be white.
Develop code for house now...

How to Draw a House?

Activate script by clicking flag
Code runs sequentially
Set pen characteristics
Make sure “pen up”
Move to starting point
Put “pen down”
Move Sprite along desired path, using move and turn blocks

Screencast on Course Website

4) Art with Randomness

http://www.kurzweilcyberart.com/aaron/history.html
http://www.kurzweilcyberart.com/aaron/aim_clip_cohen.html
4) Art with Randomness

[Images of various art pieces]
4) Algorithm with Randomness: Version A: Brownian Motion

Specification

Initial state
- Stage is empty
- Marker begins in middle of stage

Repeat forever
- Move randomly up/down and left/right
- Change to random (nearby) color
- If reach edge, go back to center

Brownian Motion

Initial state
- Stage is empty
- Marker begins in middle of stage

Repeat forever
- Move randomly up/down and left/right
- Change to random (nearby) color
- If reach edge, go back to center

4) Algorithm with Randomness: Version B: Random Turns

Specification

Initial state
- Stage is empty
- Marker begins in middle

Repeat forever
- Change to random (nearby) color
- Move in irregular arc of circle
- If reach edge, move to center

Random Turns

Initial state
- Stage is empty
- Marker begins in middle

Repeat forever
- Change to random (nearby) color
- Move in irregular arc of circle
- If reach edge, move to center

What does this code forget to do???
Programming Concepts

General
• Think about initial state
• Incrementally test code as you go
• Scripts must be activated to run (when flag clicked)
• Execution within script proceeds sequentially
• Control: forever, repeat <times>, if <question> then

Blocks in Scratch
• Movement: X-Y coordinate system for Stage
• Pen and stamps
• Random numbers

Today’s Checkup

What happens if you don’t specify the initial state of your program?
Which are likely to be used for initialization?

Announcements

Homework 2 due before class Monday
• See web page for hw details
• Any questions with cs202-tas@cs.wisc.edu

Homework 1 Graded – Available thru Learn@UW

Optional: TED Talk
• Golan Levin makes art that looks back at you
• http://www.ted.com/talks/golan_levin_ted2009.html